METEOROLOGICAL TOWER CLIMBING AND SUPPORT

Purpose

This Meteorology and Air Quality Group (MAQ) procedure describes the requirements for climbing the meteorology towers for tower or meteorological sensor maintenance.

Scope

This procedure applies to the individuals who climb the towers and the support individuals who assist the tower climbers.

In this procedure

This procedure addresses the following major topics:

Hazard Control Plan

The hazard evaluation associated with this work is documented in Attachment 1: Initial risk = **low**. Residual risk = **low**. Work permits required: none. First authorization review date is one year from group leader signature below; subsequent authorizations are on file in group office.

Signatures

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Approved by: D. Darrell Holt Darrell Holt, Acting Meteorology Monitoring Project Leader	Date: 1/9/03
Approved by: Terry Morgan Terry Morgan, Quality Assurance Officer	Date: 1/9/03
Work authorized by: Jean M Dewart Jean Dewart, MAQ Group Leader	Date: 1/9/03

01/21/03

General information

Attachments

This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	Hazard Control Plan	3

History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description Of Changes
0		Revision number not used?
1	6/86	New document.
2	11/90	Process updated.
3	4/93	Process updated.
4	5/9/94	Complete revision into new format.
5	8/24/96	Process updated and converted to ESH-17 format.
6	8/7/97	Climbing harness added, tower added.
7	3/9/00	Added HCP attachment and climbing of the PJMT AirTouch cellular tower.
8	1/21/03	Quick-change revision to add medical surveillance requirements to HCP.

Who requires training to this procedure?

The following personnel require training before implementing this procedure:

- employee who climbs a meteorological tower
- employee providing ground support

Annual re-training to this procedure is required.

Training method

The training method for this procedure is **on-the-job** training to be conducted by a previously-trained individual and will be documented in accordance with the procedure for training (MAQ-024).

Annual retraining for this procedure will be by self-study (“reading”) training.

General information, continued

Prerequisites

Anyone intending to be a tower climber must be comfortable working aloft. But the person must also be someone capable of great discretion. This is an innate ability not necessarily learned by reading a procedure. Not every issue that the climber might face can be documented and controlled – there will always be some situation which the climber must address and then make a decision.

Participation in the HSR-2 medical surveillance program for tower climbing is required.

Definitions specific to this procedure

None.

References

The following documents are referenced in this procedure:

- MAQ-024, "Personnel Training"
- MAQ-404, "Repairing, Maintaining and Calibrating Meteorological Instruments in the Field"
- LIR402-400-02.0, "FMW Exposure Limits"

Note

Actions specified within this procedure, unless preceded with "should" or "may", are to be considered mandatory guidance (i.e., "shall").

Background

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Periodic maintenance and calibration of tower mounted meteorological sensors is required. To perform this work, it is necessary for members of the Emergency Management team to climb the towers.

Location of towers

Tower locations are listed below:

- TA-6, Two Mile Mesa, 6-78
- TA-41, Los Alamos Canyon, 41-64
- TA-49, Bandelier, 49-123
- TA-53, LANSCE, 53-1020
- TA-54/WR, 54-88
- TA-59, OH-1
- Pajarito Mountain (Air Touch cellular tower)
- Pajarito Canyon

Preparation for climbing

Facility management and other notifications

Before climbing a meteorological tower, contact the appropriate facility management unit, explain the work to be performed, and comply with any site-specific training or procedural requirements.

For the Pajarito Mountain tower (PJMT) only, follow the "Steps to access Pajarito Mountain" in procedure MAQ-404 ("Repairing, Maintaining and Calibrating Meteorological Instruments in the Field").

General safety concerns and warnings

Read the **Hazard Control Plan** (Attachment 1). The person climbing the tower must be in good physical health and be able to work in situations up to 100 meters above the ground.

Tower climbing safety concerns include: falling, electrical shock (110 V ac), electrical shock from lightning, and possible injury from hand tools which are sometimes required.

Ground safety concerns include: being hit by something dropped by the tower operator, electrical shock (110 V ac), electrical shock from lightning, and possible injury from hand tools.

Environmental concerns include wind, precipitation, thunderstorms, wet working conditions from recent showers or high humidity, and cold temperatures. The wind can exacerbate an already perilous work environment. Moisture from humidity or from recent or in-progress storms could cause a climber to slip. Thunderstorms obviously are dangerous in that lightning is more apt to strike the tower than anything else. A climber ill-prepared for cold temperature may find himself unable to reach safety if stricken with the effects of hypothermia.

Safety concerns with Pajarito Mountain tower

The Pajarito Mountain tower offers a special safety concern because it is an AirTouch cellular telephone transmitting tower. AirTouch will no longer interrupt their service for any tower climbing work. This policy change came about with the acceptance of EMR (electro-magnetic radiation) protective clothing in the RF (radio frequency) transmission industry.

EMR protective coveralls have been procured for the meteorological technician. An EMR survey of the PJMT tower was conducted under the auspices of HSR-5. This survey showed that the EMR is well within safe exposure levels even without PPE (personal protective equipment), but AirTouch requires that any tower climber wear EMR protective coveralls.

Preparation for climbing, continued

Equipment needed

The following equipment will be needed for climbing a tower:

- static meter, Sweeney model number 1128D or Airborne Model M-10
- cellular telephone
- hard hats
- two safety climbing harnesses with positive-locking climbing safety device
- nylon safety line (minimum 5000 lb. breaking strength, maximum 6 ft. long)
- lanyard for tying off equipment
- tool pouch, back pack, or rope to hoist material up
- safety boots, gloves, appropriate clothes for windy and cold temperature conditions
- PJMT only – EMR protective coveralls and EMR radiation meter.

Equipment safety inspection and maintenance

Climbing Harness

- Ensure that the buckles and eyelets are secure.
- Check for fraying or other damage to the climbing harness that could cause failure.
- Check that the harness "D" rings are secure.
- Ensure the harness is correctly sized for the climber.

Safety Line

- Inspect for fraying or other damage to the lines that could cause failure.
- Inspect the end snap rings for cracks or damage.

Positive-Locking Climbing Safety Device

- Inspect for damage that could cause malfunction.
- Ensure that the device to be used is correct for the tower to be climbed.
- Near the ground, test the device by simulating the forces which would be applied by a fall and ensure that the device works correctly.

Preparation for climbing, continued

Equipment safety inspection and maintenance, continued

Tower Mounted Restraining System

- Inspect the restraining system for damage or corrosion that could cause failure. This inspection is an active process during the ascent.

EMR Protective Coveralls

- Inspect the coveralls for any fabric tears or damage. Do not use if damage is evident.
- Damaged coveralls must be returned to the manufacturer for repair and recertification.
- The coveralls maybe dry cleaned or washed on a gentle washing machine cycle. Do not machine dry the coveralls because this can break down the fabric.

Preparing to climb a tower

Check weather conditions and get a weather forecast from a group meteorologist at 667-7049. Always be alert for any weather changes, which can occur quickly in the Los Alamos area. Do not climb a tower if the weather is marginal. Do not climb a tower if the wind speed is higher or the temperature is lower than that given below:

- maximum steady state wind speed: 10 meters/sec
- minimum temperature: -10^{o}C.

Dress appropriately for the weather. Wear safety boots, gloves, and warm clothing. The wind speed increases and temperature decreases with greater height above the ground. There is no protection from the elements for a climber on an open tower.

PJMT only – In addition to clothing required to protect the climber from the weather, it is necessary to don the EMR protective coveralls. Turn on the EMR radiation meter and verify that it is operational. Clip this compact meter on the outside of the coveralls at a convenient point.

Access requirements

Refer to the access requirements for each tower in procedure MAQ-404 ("Repairing, Maintaining and Calibrating Meteorological Instruments in the Field").

Climbing a tower

When climbing a tower

The **ground support person** must check and monitor the lightning threat with the static meter before and during the ascent. If the atmospheric potential gradient reaches 2 kilovolts per meter, as measured by the static meter, the ground support person must instruct the climber to descend the tower.

A **ground support person** must be present for all tower ascents. This person must have a cellular telephone. The cellular telephone is carried to summon help as required: ambulance, fire department, or whatever an emergency may require. The ground support person must wear a hard hat and must stay clear of the base of the tower unless the work requires otherwise. The climber and the ground support person must be very aware of the possibility that the climber might accidentally drop an object that could be dangerous to a person on the ground.

The **climber** must use a climbing harness with a positive-locking climbing safety device for all climbing. The nylon safety line must also be used when the work station is reached. Connect the safety line end snap ring to a secure point on the tower before disconnecting the climbing safety device. Always remain securely attached to the tower.

Do not attempt to climb the tower with anything in the hands. Use a tool pouch, back pack, or hoist materials up by rope.

Use lanyards to tie off any equipment that is not secured in any other way to minimize the possibility of dropping something.

Emergencies

In case of an emergency

In an emergency situation, the **ground support person** must use the cellular telephone to call 911 to request appropriate assistance. The following suggestions are offered:

- Contact the MAQ group office.
- Arrange for appropriate transportation to the hospital or nearest Occupational Medicine Group medical station. Medical examination by the Occupational Medicine Group is mandatory for all work-related injuries.
- Request the assistance of the fire department. Define the assistance required, e.g. ladder truck, rescue assistance, etc.
- For PJMT only – contact the AirTouch site technician (Mike Ross, 690-0004) and request immediate shut down of the transmitters, if necessary, to allow emergency rescue.

Rescuing a disabled climber

In the event a climber becomes disabled on the tower, the **ground support person** must call 911 to request the assistance of the fire department to effect a rescue. A **fire department rescue climber** may use the second climbing harness to climb the tower and rescue a disabled climber. Use of the second climbing harness allows both rescuer and disabled climber to remain attached to the tower by their safety devices.

Records resulting from this procedure

Records There are no records that result from this procedure.

HAZARD CONTROL PLAN

1. The work to be performed is described in this procedure.
"Meteorological Tower Climbing and Support"

2. Describe potential hazards associated with the work (use continuation page if needed).

1. Falling from the tower.
2. Wet conditions -- Slipping while working on the tower.
3. Over-exertion while climbing.
4. Lightning.
5. Temperature.
6. High winds.
7. Sun exposure.
8. Hand tool injuries.
9. Ground personnel being struck by falling objects.
10. Collapse of the tower structure because of mechanical failure.
11. Work at night.
12. Electro-Magnetic Radiation (EMR) exposure during tower climbing (PJMT only).

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3. For each hazard, list the likelihood and severity, and the resulting initial risk level (before any work controls are applied, as determined according to LIR300-00-01, section 7.2)

1. Remote / catastrophic = low
2. Remote / negligible = minimal
3. Frequent / negligible = low
4. Remote / catastrophic = low
5. Occasional / moderate = low
6. Occasional / negligible = minimal
7. Frequent / negligible = low
8. Occasional / moderate = low
9. Remote / catastrophic = low
10. Remote / catastrophic = low
11. Improbable / moderate = minimal
12. Occasional/Moderate = Low

Overall *initial* risk: ☐ Minimal ☒ Low ☐ Medium ☐ High

4. Applicable Laboratory, facility, or activity operational requirements directly related to the work:
☐ None ☒ List: Work Permits required? ☒ No ☐ List:

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LIG402-10-01A, "Lightning Safety"
Participation in the HSR-2 medical surveillance program for tower climbers.

HAZARD CONTROL PLAN, continued

5. Describe how the hazards listed above will be mitigated (e.g., safety equipment, administrative controls, etc.):

Overall comments: Tower climbing will only be done by an experienced climber or a person who is trained by an experienced authorized climber and the trainee is authorized by the group leader. Contact the MAQ meteorologist for a weather forecast as necessary.

1. Use safety climbing harness with positive-locking climbing safety device. The climbing safety device is attached to the tower's antifall system for climbing. When at a work station, the climber will attach the snap ring of a nylon safety line to a secure point on the tower. The climber may then disconnect from the tower's antifall system to allow movement. The climber must always be attached to the tower.
2. The climber must exercise discretion before and during any ascent. This is true of conditions which might cause slipping. As you climb, examine the tower, e.g. look at each rung of the ladder as you ascend; the ladder attachments to the tower; the tower section bolts, guy attachments, etc. – there should be no surprises. Weather conditions in NM rarely cause or support slippery conditions, so you can always delay an ascent for another day if conditions are not safe.

See continuation page.

6. Knowledge, skills, abilities, and training necessary to safely perform this work (check one or both):

☒ Group-level orientation (per MAQ-032) and training to this procedure.

☒ Other → See training prerequisites on procedure page 3. Any additional describe here:

A tower climber must be comfortable working aloft. But the person must also be someone capable of great discretion.

7. Any wastes and/or residual materials? (check one) ☒ None ☐ List:

8. Considering the administrative and engineering controls to be used, the *residual* risk level (as determined according to LIR300-00-01.0, section 7.3.3) is (check one):

☐ Minimal ☒ Low ☐ Medium (requires approval by Division Director)

9. Emergency actions to take in event of control failures or abnormal operation (check one):

☐ None ☒ List:

Refer to the "In Case of an emergency" section of this procedure.

Signature of preparer of this HCP: This HCP was prepared by a knowledgeable individual and reviewed in accordance with requirements in LIR 300-00-01 and LIR 300-00-02.

_____	_____	_____
Preparer(s) signature(s)	Name(s) (print) /Position	Date

Signature by group leader on procedure title page signifies authorization to perform work for personnel properly trained to this procedure. This authorization will be renewed annually and documented in MAQ records. Controlled copies are considered authorized. Work will be performed to controlled copies only. This plan and procedure will be revised according to MAQ-022 and distributed according to MAQ-030.

HAZARD CONTROL PLAN, continued

Hazard Control Plan continuation page. Give item number being continued.

ITEM 5. HAZARDS MITIGATION

3. Climbing a vertical ladder up to 100 m tall is a severe work out. It is important to maintain good physical condition with a regular exercise program. Along with other strength and stamina exercises, a step block work out comes close to ladder climbing to maintain conditioning of the legs.
4. The lightning threat must be continually monitored by the tower climber and the ground safety person. Developing cumulonimbus clouds anywhere in the area are a definite indicator that it's time to get off the tower. Also, the ground support person will periodically check the electrical potential gradient with the Sweeney static meter.
5. Cold temperatures pose a greater threat to the climber than heat. The procedure specifies a minimum operating temperature of -10 degrees C. Again, the climber must exercise discretion and factor in wind and the length of time that the climber will be aloft. It is important to wear appropriate clothing to protect against the cold.
6. Wind is more of a nuisance than a hazard but a maximum operating limit is specified. That maximum operating limit is 10 m/s steady state. On the other hand, wind chill is a decided hazard and must be carefully considered. Appropriate clothing is important but if conditions are not conducive to safe work, then delay the work for another time when conditions improve.
7. Sun exposure can be minimized with proper clothing, such as long sleeves and a brimmed hat. It is also important to use a high-number sunscreen.
8. Hand tool injuries are usually things like banged knuckles, abrasions, etc. The climber simply needs to be careful.
9. The ground support person must wear a hard hat and more importantly stay 60 feet away from the tower to avoid being struck by anything dropped by the climber. There are occasions when the ground support person needs to do some support activity for the climber and will therefore need to get near the tower. On these occasions, the climber will cease all other work activities and secure all equipment which might be a threat.
10. The towers are periodically inspected by a professional tower installer. Also, as the climber ascends the tower, the climber shall inspect the mechanical integrity of the tower structure and of the lightning protection system. Because of the relatively benign NM environment (no atmospheric corrosives such as salt, no ice buildup and attendant damage, etc.) the towers do not suffer much deterioration.
11. This work is not limited to daylight hours. When working at night, plan to use sources of light, e.g. vehicle headlights, flashlights, miner's light (straps to the worker's head and allows hands-free illumination for things like tower climbing), etc. to provide illumination.
12. The Maximum Permissible Exposure (MPE) levels for E (electric) & H (magnetic) fields of 3.0 mW/cm*2 (see note below) will be maintained by minimizing exposure time, using PPE, and measuring the EMR power density levels. Meteorological maintenance on the tower will be conducted in an expeditious manner to minimize exposure time. EMR protective coveralls will be worn to reduce exposure levels. Climber will stay away from RF antennas to reduce exposure levels.

NOTE: The MPE of 3.0 mW/cm*2 is derived from LIR402-400-02.0 RFMW Exposure Limits, Table 1 Controlled Environment Exposure Limits. An EMR radiation meter, which alarms at 1.0 mW/cm*2, will be carried outside the EMR protective coveralls, to ensure that this MPE is not exceeded.